

Recent Advances at Craig Hospital

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Introduction

Craig Hospital was pleased to sponsor and support the recent International Symposium on Life Care Planning (ISLCP) conference in Denver, with a pre-conference, conference speakers, and tours of the hospital. We appreciated the partnership. We are also pleased with the opportunity to provide this update of advances at Craig Hospital and within the field of catastrophic injury rehabilitation and research. Craig Hospital is excited to report a number of different program developments over the past year in the areas of treatment and wellness, patient education, and equipment.

Telehealth Expansion

Spinal Cord Injury Nurse Advice Line (NAL) - Craig's telehealth program began with the Spinal Cord Injury Nurse Advice Line in 2008. Since then, the capabilities have continued to grow in exciting ways. Now in its fifth year, the SCI Nurse Advice line has been very successful. The national award-winning service is for people with spinal cord injury (not necessarily former Craig patients), caregivers, clinicians and case managers. Our nurses have fielded more than 11,500 calls from across the country and currently average 370 calls per month. Our nurses spend as much time as required with each caller and are available Monday through Friday, 9 a.m. to 4 p.m. mountain time. The toll-free number is 800-247-0257. On October 10, 2010, Craig's SCI Nurse Advice Line was awarded the Magnet Award- the highest nursing award in the U.S.

Webinars - In February, 2012, Craig Hospital began offering webinars to provide specialized information about spinal cord injury and brain injury to the professional community. The cost for each webinar is \$50 (proceeds help support the SCI Nurse Advice Line), and Nursing Credit Hours are available. Later this year, Craig will also begin hosting low cost webinars for people with spinal cord and brain injury and their families. Persons who are interested in being notified by e-mail, go to www.craighospital.org and follow instructions to join our mailing list. Interested persons can also register for a webinar at www.craighospital.org/webinars.

Outreach Clinics - For three decades, Craig has provided annual two-day outreach clinics in Pueblo, CO; Grand Junction, CO; and Casper, WY. Our telehealth nurses are now part of the physician-therapy-nursing traveling outreach team who provides this convenient service for former Craig patients.

Post-inpatient discharge calls - Craig's telehealth nurses call patients 30 days after their

initial inpatient discharge, to talk about the patient's well-being and how his or her discharge plan is going, answer any questions, help solve problems, and offer support and resource information.

Outpatient re-evaluation pre-admission assessments - The telehealth nurses conduct clinical assessments for patients coming for outpatient evaluations and re-evaluations. Nurses call patients and ask about their health needs and requests. The information is used to customize the patient's evaluation and help the clinic plan appointments and clinical sessions. Each year, we see approximately 630 patients in our Re-Evaluation and Evaluation programs, of whom about 75 are new to Craig.

Evidenced-based SCI and TBI library - Craig has an extensive resource library of evidence-based clinical information that is used by Craig's staff and telehealth nurses, as well as by professionals nationwide. The telehealth staff develop and maintain the library, which includes more than 600 documents and videos. www.craighospital.org/Left-Nav/SCI---TBI-Health-Info/

The PEAK Center at Craig Hospital

In June 2011, Craig Hospital opened The PEAK Center at Craig Hospital. The initials PEAK stand for Performance, Exercise, Attitude, and Knowledge. The mission of the PEAK Center is to provide an extended continuum of care for individuals with neurologic injuries and disease by facilitating neuromuscular recovery, creating lifelong fitness and wellness plans to maintain optimal health and by empowering individuals with neurologic disabilities to maximize their quality of life through knowledge and activity.

Craig Hospital has long understood that SCIs and BIs are lifelong injuries that require the support of an evolving and growing health care system. The continuum of care at Craig Hospital starts with an inpatient rehabilitation stay that provides patients and their families with a strong foundation for coping with these devastating injuries. This care can then be extended into the outpatient system where patients continue working on goals to restore their independence and function. However, after individuals with these types of injuries complete traditional outpatient programs, they often desire to be involved in programs that allow them to continue working on restoration, fitness and wellness.

The PEAK Center was created to provide services to individuals with neurologic disabilities who are seeking to optimize their recovery and prevent the secondary complications associated with immobility. State of the art services and customized treatment plans are provided to clients in a highly motivated environment after traditional rehabilitation services have been completed. To maximize access, the PEAK Center provides three levels of service to its members catering to a wide variety of individual physical needs, economic situations, and commitment levels. Individuals with neurologic disabilities have the opportunity to participate in the following three programs:

Wellness Membership: Fully adapted fitness center with knowledgeable staff onsite to design and provide guidance for fitness programs that are specific to an individual's abilities and goals.

Fitness Classes: Functional Electrical Stimulation (FES) cycling classes; Upper extremity ergometry cycling classes; Adapted yoga classes.

Activity Based Training: 1:1 training utilizing cutting edge technology by staff who specialize in neurologic injury and disease.

Restoration of function rather than compensation for lost function has been in the spotlight of neurological rehabilitation literature over the last five to seven years. Evidence

suggests that participation in intense practice and repetition of task specific related activities at a higher dosage than traditional outpatient rehabilitation offers may facilitate continued recovery in some individuals with neurologic injuries even years after their original insult¹⁻⁴. It remains unclear in the literature whether this documented recovery of function in individuals with chronic injuries is due to true neuroplasticity (the damaged nervous system rearranging its anatomical and functional connections resulting in improved motor output⁵), or simply strengthening of the remaining system not affected by the original injury allowing it to more efficiently and amply compensate for the impaired portion of the body. No matter the answer, it is clear that some individuals with neurologic impairment are making gains in function much longer than historically reported norms. New technology and treatment interventions are being developed and deployed in the clinical setting to facilitate the “learning” process and incorporate the latest findings of evidence-based treatment as part of a comprehensive program.

Recent advancements in neurological rehabilitation technology have expanded the ability of therapists and other health care professionals to provide intensive exercise protocols for individuals with significant impairment and very limited mobility in a safe environment. The overall goal of the utilization of these types of technologies is to aid individuals in recovering the ability to use their trunk and limbs to improve their independence with mobility and to promote lifelong health and wellness. The PEAK center utilizes cutting edge technology to assist clients with achieving their individual goals including but not limited to the following: body weight supported (BWS) treadmill systems (LiteGait™, Therastride™), BWS treadmill systems with robotic assistance (LokomatPro™ V6), functional electrical stimulation (FES) bikes for the upper and lower extremities (Restorative Therapies RT300 series), upright elliptical training with FES (Restorative Therapies RT600™), lower extremity FES systems designed to improve over ground walking (Bioness L300 and Bioness L300 plus) and whole body vibration (WAVE proelite).

Robotic technologies such as the Lokomat are becoming more prevalent for treating individuals with neurologic disabilities in clinical settings. The LokomatPro V6 is the latest version of the driven gait orthosis manufactured by Hocoma utilized for walking therapy in the PEAK Center. The LokomatPro V6 provides intensive locomotor training therapy in a highly motivated environment with the addition of augmented feedback. In a recent article, Tefertiller et. al. reviewed over 30 articles and determined that locomotor training with robotic assistance is beneficial for improving walking function in individuals following a stroke and SCI. The Pro V6 version is equipped with augmented feedback, which provides an encouraging walking environment coupled with task-intrinsic feedback related to walking ability. Augmented feedback has been the focus of a large body of research and is thought to have a significant influence on motor learning and performance improvement making it a very valuable addition to locomotor training therapy.

Functional electrical stimulation (FES) cycling is another treatment approach that is utilized in the PEAK center for the beneficial effects that it provides to individuals with neurologic impairments. Many authors have reported significant health and wellness benefits when utilizing this technology that are both physiological and psychological^{6, 7}. Restorative Therapies RT300 series cycles provide upper and lower extremity cycling that is augmented with electrical stimulation to the appropriate muscle groups required to produce the torque that moves the ergometers. The FES driven workload can also be supplemented by an internal motor for individuals who are weak or deconditioned. The RT600 is a recent rehabilitation product from Restorative Therapies and is utilized for upright standing and stepping training

in the PEAK Center. It combines the stepping motion of an elliptical trainer with 10 channels of FES using a BWS harness. Currently, this is the only commercially available system that provides upright stepping motion in combination with FES and BWS.

Locomotor training augmented with FES is an important intervention utilized in the PEAK Center that has been shown to improve locomotion in patients with incomplete neurologic injuries and disease⁸⁻¹⁴. The Bioness L300 uses electrical stimulation to activate the nerves of the lower leg which control the muscles that lift the foot when walking. Positive results have been demonstrated in a variety of outcomes measures of walking including speed, functional mobility and independence, spatio-temporal parameters, and the physiological cost of walking when utilizing FES for over ground walking. Studies have also shown that combining FES and locomotor training with and without BWS may be more beneficial than locomotor training alone. The L300 Plus is the most recent advancement in the Bioness lower extremity products and allows the addition of thigh control and activation along with the foot drop system which is another intervention being successfully incorporated into individualized treatment plans in the PEAK Center in both over ground and manual treadmill conditions.

Whole Body vibration (WAVE) is a common intervention incorporated in the treatment plans of appropriate individuals training at the PEAK Center. During this intervention, vibration is used as a mechanical stimulus to increase motor unit recruitment in the extremity that is contacting the vibrating platform. Early evidence studying the effects of whole body vibration with individuals who have sustained chronic SCIs has demonstrated benefits including improved over ground cadence and a reduction in spasticity^{15, 16}.

The technologies discussed above are important components of the care provided at the PEAK Center to assist clients in achieving their restoration goals as well as creating a lifelong plan for health and wellness. However, these technologies alone, without appropriate clinical decision-making and input will not provide the best outcomes for individuals with neurologic impairments. They simply provide clinicians and other health care providers with the tools that allow mobilization of individuals with very limited abilities and strength in a safe environment in both early and last stages of the recovery process in hopes of providing a greater degree of improvement and recovery of function. However, optimization of recovery requires skilled clinical decision making to determine when to deploy these interventions and at the appropriate frequency and dosage. At the PEAK Center, these tools are integrated into a client's individualized plan of care by highly trained staff based on the most recent evidence based practice, clinical experience and a client's stated goals.

Each client entering the PEAK Center meets individually with a therapist and participates in a comprehensive evaluation to assess appropriate fitness, strength and mobility goals. A unique treatment plan is then designed for each client based on their current level of ability and goals. Although a treatment plan is exclusively developed for each client, these plans are based on a series of evidence based algorithms incorporating intensive strengthening, developmental stabilization activities, and task specific motor patterned activity in a comprehensive program. These treatment plans are guided by a physical therapist, but may also be carried out by an exercise specialist. All plans are modified on a weekly basis to ensure that each client is being challenged to achieve their maximum potential.

Along with the physical aspect of recovery, the PEAK Center provides access to massage therapy, education classes, and peer support to promote a healthy lifestyle with a balance on mind, body and spirit. The recreational therapy department at Craig Hospital also plays a role in achieving this balance by providing PEAK Center members access to amazing recreational activities including white water rafting, scuba diving, competitive sports and hand cycling.

This is a hopeful time in the field of neurologic rehabilitation. Clients are motivated and empowered to reach their goals and health care professionals are committed to support research focused on discerning which interventions at what dosage, combination and intensity facilitate best long term outcomes in the realms of health, fitness and wellness. The PEAK Center is committed and excited to be a part of the community that is providing these opportunities for individuals with neurologic disabilities.

Research Update

In October, 2012, the National Institute on Disability and Rehabilitation Research (NIDRR) announced that Craig Hospital was re-designated for the Rocky Mountain Region as a “Model System Center” for Traumatic Brain Injury (TBI). Craig has been a TBI Model System Center consecutively since 1998, and a SCI Model System Center since 1974. In addition, in November, 2012, the Christopher & Dana Reeve Foundation announced that Craig Hospital is now a part of its Christopher & Dana Reeve Foundation NeuroRecovery Network (NRN). The NRN is a national network of leading-edge rehabilitation centers designed to provide and develop therapies to promote functional recovery and improve the health and quality of life for people living with paralysis. Funded by the Reeve Foundation through a cooperative agreement with the Centers for Disease Control and Prevention (CDC), the NRN translates the latest scientific advances into effective, activity-based rehabilitation treatments.

About Craig Hospital

Craig Hospital is a private, non-profit, hospital in Denver, CO that exclusively specializes in the rehabilitation and research of individuals who have sustained spinal cord injury (SCI) and traumatic brain injury (TBI). In 2011, Craig Hospital provided care to people from 47 states and several foreign countries. Craig is accredited by the Joint Commission and is a Magnet recognized hospital in 2005 and 2010. This year Craig Hospital was ranked in America’s Top Ten Rehabilitation Hospitals by *US News and World Report* for the 23rd consecutive year. Craig Hospital has earned a place among the top rehabilitation hospitals in the world secondary to the achievements of our graduates and the innovative and state of the art clinical care they have been provided.

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